A Locomotive for Working Steep Gradients.

An English engineer, Mr. Andrew Handyside, has recently patented in England and this and several other countries a locomotive engine for drawing trains up inclines. A trial was recently made with one of these engines at Bristol, England, and the result was such as to show that the invention is one of some merit.

The engine weighed 13 tuns, and to it were attached two trucks weighing together 25 tuns 14 cwt.; and one portion of the line on which the trial was made was on an incline of 1 in 12. The peculiarity of the system is that the engine is coupled to the train by a steel chain or wire rope, wound round a drum mounted in the framing of the engine. The axis of this drum works horizontally in bearings fixed in the main framing of the engine, and it is rotated by gearing from a separate pair of cylinders, distinct from the usual cylinders which drive the locomotive. A drum, 2 feet in width and 1 foot in diameter, will accommodate chain enough to fulfil all the requirements of the system. On each side of the engine framing, and on each side of one or more carriages or wagons of the trains, there are suspended one or more self-acting gripping struts, which, when let down on the rails by the driver or other person in charge of the train, will firmly grip the sides of the rails, and hold the engine or train stationary. On arriving at the foot of the incline, the engineer releases the hauling drum, and, without stopping the engine, runs up the gradient to the required distance. The struts are then let down on the rails; and by grasping the rails, they render the engine stationary, and the load is drawn up to the engine much after the fashion that loads are drawn up inclines at collieries. The last truck of the trial train was furnished with an automatic gripping strut, which, when the trucks commenced a retrograde movement, at once grasped the rails on each side, and held the train in its place beyond the possibility of its being moved, our informant states, even when the engine with full steam on was backed against it.

The experiments were of the most thorough description, and the invention was tested in every way. In the first place, the value of the gripping strut was shown. The powerful little engine mounted the gradient without its load, and, full steam on, ran the whole length of the siding. At a signal from Mr. Handyside, the brakes were applied, and the engine was brought to a standstill in the length of a rail and a half. The contrast between the power of this brake and the ordinary hand brake, with which the engine was also supplied, was fully shown. The wagons were then attached, and the brakes on the engine and on the brake van were applied simultaneously with equally satisfactory results. This experiment was witnessed with very considerable interest, as the brake question is just now occupying very much of the attention of railway men. With the continuous brake, it was pointed out that, 90 per cent of the wheels being braked, a train is pulled up in about 900 feet with the train going at a speed of fifty miles per hour. In this case, the train pulled up in 600 feet, and only 75 per cent of the carriages were braked. After duly testing the brake, the method of mounting steep gradients was shown. The engine put full steam on, ran to the foot of the incline, and then, letting out the steel wire rope which coupled it to the trucks, mounted the steep alone. The gripping struts were then let down; and the engine having thus been made stationary, the trucks were hauled up to it, the automatic gripping strut coming into action, and the whole train remaining stationary. The accomplishment of this test occupied a surprisingly short time. The trucks were then lowered to show the control which the driver was able to exercise over a train for lowering purposes. The company claim that, by this invention, smaller and less powerful engines may be used on heavy gradients, and that it will allow of less cost in constructing lines, inasmuch as less cutting will be required.

Detection of Adulteration in Wine by Means of Absorption Spectra.

Professor H. Vogel states that the simplest method of detecting adulteration in wine, especially in regard to the coloring matter, is by means of the spectroscope. The apparatus required is as inexpensive as the operations are simple. Professor Vogel employed for the purpose a pocket spectroscope which cost in Berlin 36 mark (about $9.00). The instrument is first directed towards the blue sky, or to its reflection in a mirror, clamped in a horizontal position in a retort holder, and the slit closed until the principal Fraunhofer lines, C, D, E, F, G, and a few intermediate lines are distinct. The liquids to be studied are put into square white bottles about 0·30 inch thick, and placed before the slit.

It is well known that many substances of similar color have produced very unlike absorption spectra, while others, which are very different chemically, have very similar absorption spectra, like chloride of iron and tincture of iodine. These facts are no objection to spectral analysis by absorption. It resembles analysis by polarization, which cannot be employed for all substances; but where it can be used, it is invaluable.

Analysis by the absorption spectra, of course, assumes various spectra to be known, and here stands a serious barrier in the way of its present extensive introduction, namely, the maps of absorption spectra, which are insufficient and incomplete. Drawings made in the ordinary manner are incorrectly reproduced by the lithographer or engraver, and rendered still more imperfect by the coloring applied. For this reason Dr. Vogel employs the graphic method as follows: Upon a horizontal line or abscissa he erects perpendiculars to represent the chief Fraunhofer lines, and represents the absorption of a given substance by a curve, the hight of which increases with the intensity of the absorption.

The absorption bands of the most important coloring substances lie between C and F; those which lie beyond C require sunlight for their study, which is not always to be had, and hence they are useless. At the request of certain wine dealers Professor Vogel has investigated and published the absorption spectra of pure and colored wines. Perfectly pure specimens of the following sorts of red wine were obtained from reliable sources, namely: Assmannhauser, Burgundy, Nuits, Cote d'Or, and Bordeaux. Although they differed in age and intensity of color, they give the same spectra.

Pure concentrated wine absorbs the whole spectrum to the orange. Dilute wine destroys the dark blue almost entirely, allows the light blue to pass, but absorbs the green and yellow green, and stops at D, while red goes through unchanged. Tartaric or acetic acid darkens pure wine inconsiderably. Ammonia changes the color of wine to a dark gray green, and makes it much more opaque, so that it must be strongly diluted in order to obtain the spectrum, which is totally different. Indigo and blue are strongly absorbed; the absorption sinks towards the green and is least in the yellow and orange, but exhibits a faint band in the orange. By lamp light, the absorption of alkaline wine is scarcely perceptible.

The spectral reactions of the substances employed to color wines are quite different. Those coloring substances which are objectionable to the taste, but not injurious to health, give reactions very similar to those of red wine. The juice of bilberry, sour cherry, and elderberry, and extract of mallow blossoms absorb nearly the whole spectrum. For this reason it is preferable to add one part of tartaric acid or of ammonia to 10 parts of the juice.

Opening to Navigation of the Vicksburg Cut-off.

The city of Vicksburg, Miss., is located on high bluffs, under which the Mississippi makes its way by sharp deflections, east and west, of nearly fifty miles from its direct course. During the late war the Union commanders sought to avoid the heavy batteries of the Confederates at Vicksburg, which commanded the river, by opening a cut-off or canal across the country, back of De Soto Peninsula, opposite Vicksburg. The river at the upper or northerly end of the canal was accordingly shut off by a dam; and the work of digging the channel was then carried on extensively, with every promise of success, until, by a sudden rise of the river, the water broke through the dam and put a stop to the work.

General Grant, finding that too much time would be consumed in the endeavor to repair and finish the channel, adopted other expedients for passing the batteries, and the canal was left unfinished. It has now, however, been completed by the silent mining operations of the river itself; and the boats pass up and down through it, avoiding the *détour* to Vicksburg, and thus saving about thirty miles of navigation. Our engraving shows the general position of the new canal cut-off.

A Canal from the Hudson to the Mississippi.

Mr. W. J. Abernethy, editor of the Minneapolis *Farmers' Union*, writes to point out that the two principal rivers—the Fox and Wisconsin—together form an almost unbroken water channel from the Father of Waters to the great lakes. Rising, the one in the southern and the other in the northern part of the State, they flow towards each other until their waters almost touch, when they suddenly sweep away at right angles, and empty, one into Lake Michigan at Green Bay, and the other into the Mississippi at Prairie du Chien.

In a few weeks, the canal which is to join the two will be completed, and Wisconsin will honor the event with appropriate ceremonies.

On the Fox River a system of slack water navigation has been adopted, which is proving entirely successful. There are numerous falls on what is known as the Lower Fox, and these are overcome by dams with locks, to pass boats around them. The work is so far advanced that, if no unforeseen obstacles occur, vessels can run up its entire distance to Portage (160 miles west of Lake Michigan) this fall, and pass over into the Wisconsin. Considerable dredging, however, remains to be done on this river.

The Wisconsin river is, at the portage, three fifths the size of the Mississippi at St. Paul. It is a rapid stream, full of floating sand, which in low water seriously obstructs navigation. Sections of the river have been improved by wing dams; but in order to permanently secure a navigable channel, it will be necessary, in some sections of it, to make a canal on the bank. According to surveys made for a canal by General Warren, of the United States Engineer Corps, it can be built, says our correspondent, the entire distance from Portage to the Mississippi, 118 miles, for $4,164,270.

SCIENTIFIC AND PRACTICAL INFORMATION.

DYNAMITE.

Sobrero, the inventor of dynamite, in a recent communication to the Academy of Turin, designated two of the operations in the manufacture of dynamite as especially dangerous: first, the mixing of the nitroglycerin with the infusorial silica (*kieselguhr*), and second, pressing the mass into molds for cartridges. In both cases an explosion may easily be caused by friction and pressure. Nobel recommends the following process as far safer, namely, to mix the silica with water to a dough, then press it into cartridge molds and dry perfectly. These cartridges are then put into nitroglycerin, which they absorb into their pores, the absorption being aided by exhausting the air. Sobrero made his experiments with infusoria of Italian origin which can be easily made into cartridges that will absorb as much as 75 per cent of their weight of nitroglycerin.

A FALLACIOUS TEST FOR LEAD IN TIN.

An item has been widely circulated, both here and abroad, in which it was stated that the presence of lead in tin could easily be detected by putting a drop of nitric acid on the clean surface of tin plate, heating gently to cause it to attack the metal and evaporate the excess of acid, and moistening the white spot with a five per cent solution of iodide of potassium; if lead were present, the spot would become more or less yellow from the formation of iodide of lead. Dr. A Puerkhauer calls attention to the fact that tin, free from lead, will also yield a yellow spot when thus treated, evidently due to the liberation of iodine by the presence of free acid; for nitric acid cannot be completely expelled from tin, even when the tin is heated to its melting point. It may be easily proved that the yellow spot, formed on tin which is free from lead, is due to the liberation of iodine, by touching the spot with starch paste. The above mentioned reaction can be made reliable by touching the white spot made by nitric acid with very dilute caustic potash before applying the iodide of potassium, when a yellow coloration will not fail to indicate lead.

SUBCHLORIDE OF COPPER IN VERDIGRIS.

Wittstein has found in some samples of acetate of copper a white precipitate, insoluble both in water and acetic acid, but soluble in dilute mineral acids. Investigation showed that this peculiar body consisted chiefly of subchloride of copper formed by the chlorhydric acid, which is always present in acetic acid made by decomposing crude acetate of lime with chlorhydric acid. For this reason manufacturers of verdigris would do well to use only such acetic acid as has been made by the use of phosphoric or sulphuric acid, as these acids are not sufficiently volatile to distil over with the acetic acid.

A GREEN VARNISH FOR METALS.

A varnish for small or large metallic articles can be prepared, says the *Industrie Blätter*, in the following manner: Finely pulverized gum sandarac or mastic (the latter, however, is too expensive for some uses) is dissolved in strong potash lye until it will dissolve no more. The solution is diluted with water and precipitated with a solution of a copper salt, either sulphate or acetate. This green precipitate is washed, dried, and dissolved in oil of turpentine. This produces a fine green varnish which does not change under the effect of light, and will be especially useful for ornamental iron work.

HERACLINE.

This is the name given to a new blasting powder, invented by Dickerhoff, and which has been tried with success in the coal mines of France and Austria. It is composed of picric acid, saltpeter, nitrate of soda, sulphur, and sawdust. The gases produced by its combustion are not injurious, it is claimed, and it burns comparatively slowly, so that it only tears apart the masses blasted, but does not hurl them violently about.

DECISIONS OF THE COURTS.

United States Circuit Court---District of New Jersey.

BOTTLE STOPPER FASTENING.—HENRY W. PUTNAM *vs.* HENRY W. YERRINGTON.

[In equity.—Before Nixon, J.—Decided March 28, 1876.]

Mere change of material used in the construction of devices is not invention; it is only the exercise of mechanical judgment, and hardly adds enough to the domain of knowledge to raise the person to the dignity of an inventor who first thought of making such a change.

The mere carrying forward of an original conception patented—a new and more extended application of it—involving change only of form, proportions, or degree, the substitution of equivalents doing the same thing as did the original invention, by substantially the same means, with better effects, is not such invention as will sustain a patent.

It is the invention of what is new, and not the arrival at comparative superiority, or greater excellence in that which was already known, which the law protects as exclusive property, and which it secures by patent.

A reissued patent must be for the same invention as the original, containing no new matter.

It is not meant by this that no new or different language should be employed.

New matter is such an enlargement of the original specification or claims as to include combinations or results which did not necessarily flow from the invention, as originally stated and described.

An inventor is entitled to all the uses to which his patent may be applied, and to all the beneficial results which legitimately follow the use of his instrumentalities, as shown by the statement of his invention, and the figures used to illustrate it; and such uses and results may be stated and described in an application for reissue by the inventor, without subjecting himself to the imputation of incorporating new matter.

NIXON, J.:

The bill is filed in this case for the alleged infringement of reissued letters patent No. 1,606, for a new and useful improvement in bottle-stopper fastenings.

The original patent was issued to the complainant March 15, 1859, for the term of fourteen years. This being duly surrendered, he obtained the reissue on the 19th of January, 1864, for the residue of the term, which was further extended by the Commissioner of Patents for seven years, from March 15, 1873.

The defendant, in his answer, and afterward by stipulation, admits the infringement of the four claims of the said reissue, but insists that the said patent is invalid for two reasons: first, because the complainant was not the original and first inventor; and second, because the reissue is not for the same invention as that shown and described in the original patent.*

I have carefully compared the complainant's patent at first obtained with his reissue. The statement of his invention and the figures used to illustrate it are the same in both cases. Not a device or instrumentality appears in the second that was not exhibited in the first. He states results in the reissue which were not stated in the original patent, and which were omitted, I presume, because he did not know until he was taught by experiment that such results would follow. But an inventor is allowed to do this in a reissue without subjecting himself to the imputation of incorporating new matter. He is entitled to all the uses to which his patent may be applied, and to all the beneficial results which legitimately follow the use of his instrumentalities.

The principal new effect which he sets forth in the reissue, and which he failed to note in his former specifications and claims, is the substance of the first claim—to wit: Such a formation of the new fastener over the cork that the pressure thereon may cause the fastener to hold more securely, as specified. No new device was needed to accomplish this result, and hence the claim falls within the objects and purposes of a reissue.

[*Thomas H. Dodge* and *Palmer E. Havens* for complainant.
F. C. Nye and *L. C. Ashley* for defendant.]

United States Circuit Court---Southern District of Ohio.

THE UNION PAPER-BAG MACHINE COMPANY *et al. vs.* NIXON & CO.

[Before Emmons & Swing, JJ.—Filed March 20, 1876.]

It is not a fair construction of the assignment of a patent that the assignee shall first assign the entire right for a particular territory, and get its whole value from his vendee, and, after having thus received all the benefit he was entitled to under the transfer, sell single machines to be used in the same territory during the extended term.

An assignee of a patent, by granting and transferring the exclusive right to manufacture or use an invention within such State, exhausts his whole power of disposition under and by virtue of the assignment to him; and such assignee has no right to flood the country with machines to be used after the expiration of the term of the original patent, thus defeating the interest of the patentee in the extension.

The rise to use a machine after the expiration of the term of the patent is an incident to the primal right to use it during the original term; if that fails on account of fraud, the incident falls with it.